

Remarks/Arguments

The Office Action of June 20, 2003 and the references cited therein have been carefully studied and reviewed, and in view of the foregoing Amendment and following representations, reconsideration is respectfully requested.

Concerning the rejection of claim 27 under 35 USC 112, second paragraph, the dependency of claim 27 has been corrected, thereby rendering the rejection moot.

Concerning the rejection of claims 25 and 28 under 35 USC 112, second paragraph, Applicants respectfully submit that the terms high-temperature oxide layer (HTO) and middle-temperature oxide layer are terms of art, i. e., have a definite meaning well-known to anyone of ordinary skill in the semiconductor device manufacturing art. As such, those of ordinary skill in the art would readily be apprised of the scope of the claims, contrary to the position taken by the Examiner in the Office Action. In support of their assertion, Applicants note that a quick search of Patent Office database turns up a multitude of U.S. patents alone that employ the terms high-temperature oxide layer and middle- or medium-temperature oxide layer; in this respect, the attention of the Examiner is particularly directed to USP 6265268, USP 6,162,675, USP 6,162,649 and USP 5,854,107. Accordingly, it is respectfully requested that the rejection under 35 USC 112, second paragraph, based on the use of the terms high-temperature oxide layer and medium-temperature oxide layer, be withdrawn.

Finally, claim 25 has been canceled, and claim 11 has been amended so as to incorporate the subject matter of claim 25 therein. Similarly, claim 28 has been canceled, and claim 17 has been amended so as to incorporate the subject matter of claim 28 therein. Thus, the Amendment does not raise any new issues requiring further search and/or consideration. Accordingly, it is respectfully requested that the Amendment be entered. Reconsideration of the rejections of claims 25 and 28, as now applicable to independent claims 11 and 17, are also respectfully requested.

Bohr (USP 5,536,675) discloses forming a trench oxide layer 252 corresponding at best to Applicants' claimed thermal oxide layer 114, followed by filling the trench with a first oxide layer (silicon dioxide). However, Bohr fails to disclose the forming of any buffer layer just prior to the filling of the deep trench with the first oxide layer. That is, Bohr fails to disclose any step corresponding to Applicants claimed step (f), namely the forming of a buffer layer followed by a step (g) of filling the trench, **in which the buffer layer has been formed**, with an oxide layer. In particular, Bohr fails to disclose the forming of a buffer layer from one of a high temperature oxide layer, a middle temperature oxide layer and a plasma-enhanced oxide layer, as now claimed.

The reference to Chang et al. (USP 6,326,310) does not disclose a trench isolation structure comprising a buffer layer.

Therefore, the references to Bohr and Chang et al. can not render obvious the subject matter of claim 11 (old claim 25).

Moreover, Applicants feel compelled to reiterate their position that there is no suggestion which would have motivated one of ordinary skill in the art to have modified the method of Bohr in view of the teachings of Chang et al. in order to achieve “any desired trench profile” as suggested by the Examiner. First, Bohr already discloses an anisotropic etching that can control the profile of the deep trench 242b, if desired (col. 6, lines 15 – 19). Thus, there is no need or reason to turn to the teachings of Chang et al. Secondly, Chang et al. only suggest their method as a means of “providing shallow trench profile shaping”. Thus, Chang et al. provide no suggestion that would have motivated one of ordinary skill in the art to have used their technique for forming the deep trench 242b of Bohr.

Yoo et al. (USP 6,033,969), like Bohr, also fail to disclose a trench isolation structure comprising a buffer layer.


Therefore, the references to Bohr and Yoo et al. can not render obvious the subject matter of claim 17 (old claim 28).

The remaining secondary references have been reviewed but are not seen to overcome the deficiencies discussed above in connection with the rejections of amended claims 11 and 17 (old claims 25 and 28).

That is, for the foregoing reasons, namely because of the differences between Applicants' invention, as is now claimed, and the references, including the lack of suggestion of a method of manufacturing a trench isolation layer, wherein one of a high temperature oxide layer, a middle temperature oxide layer and a plasma-enhanced oxide layer is formed as a buffer layer in a deep trench over a thermal oxide layer (whose lateral portions each have an arcuate profile at an interface with the upper surface of a semiconductor substrate), it seen that the reference can not render Applicants' claims 11 and 17 obvious under 35 USC 103. Accordingly, early reconsideration and allowance of these claims are respectfully requested.

Respectfully submitted,
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October 20, 2003

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